Abstract

This document provides an overview of Interaction Process Automation and all its components. It also provides descriptions of the basic terms and concepts related to Interaction Process Automation.
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Introduction
Interaction Process Automation (IPA) provides the tools to automate just about any common process. It takes a communications-based approach to process automation, taking advantage of and building on the wealth of existing technologies and features in the PureConnect platform.

Interaction Process Automation extends existing IP communications technology to encompass process automation. The communications system becomes the process automation platform for your organization by doing the following:

- Using Customer Interaction Center features to queue and deliver work items like it does interactions.
- Providing presence management information to determine whether a person is available to perform work assigned to them.
- Using skills-based routing to route work items to the people who are best able to perform the work.

IPA and CIC Clients
You can use IPA work items with Interaction Desktop or IPA Work Item Client, a web-based application that allows users to complete tasks that are part of a process.

**Note**: You cannot log on to IPA Work Item Client and a CIC client at the same time.

Customer Interaction Center (CIC) supports two interaction management client applications. This documentation uses the term "CIC client" to refer to either Interaction Connect or Interaction Desktop.

General Steps
Process automation using Interaction Process Automation includes these general steps:

1. **Decide**. Decide what information you want to track in the process. Create the process variables and assign data-level security to sensitive information.

2. **Design**. Design the user interface forms (work items) that users see. Drag and drop various interface controls onto the canvas and associate them with different pieces of process data.

3. **Define**. Define and lay out the process flow. Define the states (the high-level stages a process goes through), and select the actions and tasks within each state. Actions can include accessing a database, invoking a web service, calling a handler, interfacing with a mainframe or third-party application, sending email, queuing tasks for groups, and more.

4. **Deploy**. Once you deploy a process, assigned work items appear to users in Interaction Desktop or IPA Work Item Client.

Database Support
Interaction Process Automation supports SQL Server 2005 and later versions. Customers using CIC with SQL Server 2000 must upgrade before installing the service update that contains Interaction Process Automation. Otherwise, your database administrator has to install and run the IPA database scripts manually.

Interaction Process Automation is compatible with Oracle 9i and later versions. Process Automation Server cannot store data about processes in Oracle, though it can store and retrieve other kinds of data in Oracle.
## Components

These PureConnect program components are either part of Interaction Process Automation or work directly with Interaction Process Automation in some way:

<table>
<thead>
<tr>
<th>Component</th>
<th>Who uses it?</th>
<th>What does it do?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interaction Process Automation Designer (IPA</td>
<td>The person who designs</td>
<td>This module in IC Server Manager has a graphical process definition interface. It allows the process designer to:</td>
</tr>
<tr>
<td>Automation Designer)</td>
<td>processes (process designer)</td>
<td>• Define the information necessary for the process.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Define the states through which the work moves in the process.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Define the tasks performed in each state.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Create the work items presented to users assigned to work on the tasks.</td>
</tr>
<tr>
<td>Interaction Process Automation Monitor (IPA</td>
<td>Supervisors</td>
<td>This module is a real-time supervisory module in both IC Business Manager and IC Server Manager. This module displays the status of every process, its current state, what or who it is waiting on, how long it has been running, and more. Users can only view the data for which they have authorization.</td>
</tr>
<tr>
<td>Automation Monitor)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interaction Administrator</td>
<td>Administrators</td>
<td>This program allows the administrator to configure security, access control, licensing, and other aspects of CIC, and also includes configuration options for Interaction Process Automation.</td>
</tr>
<tr>
<td>Customer Interaction Center (Server)</td>
<td></td>
<td>This program provides a range of built-in contact center applications including Interactive Voice Response (IVR), Automatic Call Distribution (ACD), skills-based routing, multimedia queuing, call recording, screen recording, predictive dialing, workforce optimization (agent scheduling), and speech analytics.</td>
</tr>
<tr>
<td>Component</td>
<td>Who uses it?</td>
<td>What does it do?</td>
</tr>
<tr>
<td>----------------------------</td>
<td>----------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>IPA Work Item Client</td>
<td>Users</td>
<td>The IPA Work Item Client is a web-based application that allows users to complete tasks that are part of a process. Work items represent these tasks. A work item is a form that gathers information. Work items could represent the tasks involved in processing a customer order, a loan application, an insurance claim, or other form of work.</td>
</tr>
<tr>
<td>Interaction Desktop</td>
<td>Users</td>
<td>This program is a client application for Customer Interaction Center. This desktop application allows users to access Customer Interaction Center features and acts as a graphical call manager. With IPA, it allows users to deal with their assigned work items and search for an existing or running process and see its status. Starting a process instance in Interaction Desktop “pops” a work item that allows the user to input information. It could also invoke an existing application and pre-fill it with the appropriate information.</td>
</tr>
<tr>
<td>Interaction Designer</td>
<td>Developers</td>
<td>This program is a graphical application generator you can use to write the programs (handlers) that control various interaction processing behaviors within CIC.</td>
</tr>
<tr>
<td>Interaction Attendant</td>
<td>Supervisors or</td>
<td>This program is a graphical call flow manager. It allows organizations to create IVR menus and determine how to route and queue calls, emails, and other interactions within the organization.</td>
</tr>
<tr>
<td></td>
<td>Administrators</td>
<td></td>
</tr>
<tr>
<td>Interaction Supervisor</td>
<td>Supervisors</td>
<td>This program includes the ability to monitor and view queued work items.</td>
</tr>
<tr>
<td>ACD Server</td>
<td>(Server)</td>
<td>This server is a subsystem on the CIC server that can calculate agent and interaction scores quickly to route interactions effectively. ACD includes a new Work Item interaction type for Interaction Process Automation.</td>
</tr>
<tr>
<td>Component</td>
<td>Who uses it?</td>
<td>What does it do?</td>
</tr>
<tr>
<td>----------------------------</td>
<td>--------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Process Automation Server</td>
<td>(Server)</td>
<td>This server is a subsystem on the CIC server. It does the following:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Parses the process definitions created in IPA Designer.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Watches for configuration changes and sends notifications to Session Manager.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Executes processes and their actions.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Creates and monitors work item interactions.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Writes process data to the database.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Calculates and sends status updates for action executions and errors to the IPA Monitor.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Enforces security specifications on data leaving the server.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• PAS uses a Microsoft SQL Server database to store and retrieve data used by processes in any ODBC-compliant database.</td>
</tr>
</tbody>
</table>

**Architecture**

Interaction Process Automation is an extension of the PureConnect platform. Together, they offer both client and server-side components connected seamlessly through TCP/IP. A service-oriented architecture (SOA) interconnects all components, allowing processes to use all the power of the PureConnect platform, including:

- A SIP-based IP PBX.
- Connectivity to Microsoft Office Communications Server and Cisco Call Manager.
- The ability to send and receive telephone calls and faxes using voice over IP (VoIP).
- Integration with email systems including Microsoft Exchange, Lotus Notes, and Novell GroupWise.
- The ability to invoke web services.
- Mainframe access.

Interaction Process Automation runs on stock servers with built-in capabilities for redundancy and is suitable for organizations of all sizes.
Installation
Interaction Process Automation installs automatically as part of a CIC installation. It updates when you apply updates. IPA components install on the CIC server and with the Customer Interaction Center CIC server and client workstation components (CIC User Applications, IC Business Manager, and IC Server Manager). It requires the appropriate IPA licensing.

Prerequisites
Before installing and running Interaction Process Automation:

- Install CIC. For instructions, see the PureConnect Installation and Configuration Guide in the PureConnect Documentation Library.
- When you run IC Setup Assistant, set up a SQL or Oracle database for data storage and reporting. Review the Database Support section of this document.
- Obtain a CIC license that includes the appropriate IPA licenses.

IPA on the CIC server
The Interaction Process Automation server components install automatically when you install Customer Interaction Center 4.0 or later on the CIC server. Following the installation, perform the following tasks to get Interaction Process Automation running on the CIC server:

To install the Interaction Process Automation update on the CIC server in your test environment, do the following:

- Start CIC and then start Interaction Administrator.
- In Interaction Administrator, update the license so that IPA licensing is available.
- Set the appropriate licensing and access control for users. For more information, see the Interaction Administrator Licensing help topic. See also the following Licensing Options and Access Control sections.
• Assign the Process Designer license and Launch, View, and Manage Process access rights to the CIC administrator.
• To confirm installation of all the components, continue to Verify the Server Install on page 7.

**Note:** It is best to install IC Server Manager on a non-server operating system because IPA Designer could render pages slightly differently due to Windows Presentation Foundation (WPF) styling and video support.

**Install note for Internet Explorer users:** If Internet Explorer requires server verification for all sites, the install displays a warning. Add the following to the list of Trusted Sites after the install completes:

```
about:security_ICSystemManager.exe
```

The **Require server verification (https:) for all sites** option appears under Options/Trusted Sites/Sites in Internet Explorer. If you don't select this option, the system adds the information to the list of trusted sites during the install. Interaction Process Automation Designer requires this setting for the use of the Send Email action.

### Licensing Options

The following table describes the differences between the licensing options.

<table>
<thead>
<tr>
<th>Users with this license can:</th>
<th>Direct-routed Work Items</th>
<th>Group-Routed Work Items</th>
<th>IPA Monitor</th>
<th>IPA Designer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start any process for which they have rights?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Receive ACD-routed work items?</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Receive direct-routed work items?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Use IPA Monitor?</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Start test processes they are designing, regardless of launch rights in IA?</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Access Control

On the Access Control tab for users in Interaction Administrator, you can assign these access control rights:

- **Launch Process** – Users with this right can start any published process in the Processes list in Interaction Desktop, IPA Work Item Client or through IceLib.
- **View Process** – Users with this right can search for processes in Interaction Desktop or IPA Work Item Client.
- **Manage Process** – Users with this right can manage (for example, cancel or retry) processes in the Process Monitor module of Interaction Process Automation or IC Business Manager Applications.
Also, the originator of a process has implied View Process rights. Therefore, if a user has Launch Process rights but does not have View Process rights, the user can only view the processes that the user started.

IPA requires other access control rights, such as View Skills or View Workgroups, for users to access skills or workgroups. For more information, see the Interaction Administrator Help in the PureConnect Documentation Library.

Verify the Server Install
To verify installation of the IPA components on the CIC server, do the following:

- Start Interaction Administrator on the server.
- Verify that the Interaction Process Automation container exists under the System Configuration container, and that the Security Specifications container exists under the Interaction Process Automation container.
- From the Start menu, click Programs, point to Interactive Intelligence, and then click IC Server Manager.
- From the Tools menu in IC Server Manager, click Module Management and verify that the Interaction Process Automation components appear and that you acquired the licenses.

Note: CIC has concurrent licensing, which means that you can only acquire IPA licenses on a single machine. For example, if a user is running Interaction Desktop on one machine and then starts IPA Designer on another machine, IPA Designer fails to load the IPA module because the license is in use on another computer. The user must run IPA Designer and Interaction Desktop on the same machine. For more information about concurrent licensing, see the PureConnect Licensing Technical Reference in the PureConnect Documentation Library.

- Start Interaction Desktop or IPA Work Item Client on the server and verify that the Processes menu appears and that the My Work Items tab appears next to the My Interactions tab.

IPA on Client Workstations
The Interaction Process Automation client workstation components install automatically with the CIC User Applications and IC Business Manager Applications. After running the installs or updates, no further action is necessary for CIC User Applications or the IC Business Manager Applications because licensing and access control allow Interaction Process Automation functionality.

In IC Server Manager Applications installations, however, the Interaction Process Automation feature is optional. Select Interaction Process Automation in the Custom Setup dialog when installing IC Server Manager Applications, as it doesn’t install by default.

Note: If you installed IC Server Manager Applications and didn’t select the Interaction Process Automation feature, follow these steps to allow that feature:

To allow Interaction Process Automation on a Client Workstation
Do the following to allow Interaction Process Automation in Server Manager Applications:
1. From the **Start** menu, click **Control Panel**, and then click **Add or Remove Programs**.
2. Locate **Interaction Center Server Manager Applications** under **Currently Installed Programs**.
3. Click **Change** to start the Server Manager Applications install.
4. Click **Next** at the Welcome screen, and then click **Change** to change the list of installed features.
5. From the list of features, select **Interaction Process Automation**, and then complete the install.

**Working with the Process Automation Server**
The Process Automation Server (PAS) runs processes created in Interaction Process Automation Designer. It uses a Microsoft SQL Server database to store and retrieve data about processes, and can use any ODBC-compliant database to store and retrieve data used by processes.

**Disk Space and Memory Requirements**
Process Automation Server can use astronomical amounts of memory: its limit is 16 exabytes. If processes need more RAM than your server has available, Process Automation Server pages the extra data to disk. However, ensure that adequate disk space is available. In the improbable event that PAS runs out of both RAM and disk space, it fails.

Process Automation Server has these enhancements:

**IPA Monitor**: Instead of monitoring every workflow in the system constantly, create filters to show only the flows that you want to monitor. The server is then more scalable and reliable.

**Note**: If your filter is too loose and too many flows start showing up, PAS cancels your filter because it returns too many results. Create a more narrow filter.

**PAS is 64-bit**: If you use Database actions in your workflows and connect to an Oracle database, the computer with Process Automation Server must have the 64-bit version of the Oracle ODBC driver available. SQL Server doesn’t require any special steps.

Process Automation Server stores data about workflows only in a Microsoft SQL Server database, though it can use any ODBC-compliant database for other kinds of data.

**Easier and more fault-tolerant switchovers:**
- For planned switchovers, Process Automation Server requires no special actions.
- For unplanned switchovers, Process Automation Server requires no special actions if you can start the now-backup-server.
- If you cannot start the now-backup server for unplanned switchovers, run the "flow_admin.exe" tool and follow the prompts to restart flows from the backup server.

**Concepts and Terminology**
This section defines and describes the major concepts and terms related to Interaction Process Automation.
**Process Variables**

Process variables are the placeholders for the information you want to store and track in a process. Every process must define a list of data variables and any restrictions on those variables.

A process can include both global and local data variables. Global variables are available to an entire process, while local variables are only available within the scope of the object (state or task) in which you defined them.

In a Car Loan process, for example, you can have variables to track the customer’s information, and information about the loan request, the vehicle, and the loan status.

**States**

You define a process first in terms of states. States define the pipeline through which work flows. Each state contains a series of tasks and actions. States can relate to the following:

- The department involved with processing a portion of the process.
- The industry-defined portion of a process.
- The portion of a process that best practices defines.

State definitions appear graphically in the IPA Designer module in IC Server Manager.
A state can have local data variables, which are variables that only the state uses. States can have inputs to allow local variables to populate them from the calling state or task. All processes must contain at least one state. The user who designs the process can select the starting state, and that state can call other states or tasks.

Tasks
Tasks are the fundamental building blocks in a process definition. You define a process in terms of the tasks involved, the sequence of those tasks, and the process control objects that exist between them.
You can only place tasks under states and tasks can only call other tasks. Tasks are reusable within the same process.
A task consists of:
• A name
• A description
- Actions
  - **Note:** The ChangeState and EndProcess actions are state-level actions and you cannot add them to a task.
- Local variables, which are variables assigned only to that task
- Inputs and outputs that populate local variables from the calling state or task

Tasks definitions appear graphically in IPA Designer:

**Actions**
Actions are the smallest unit of work in process automation. Actions are similar to programming statements in a programming language. They can do things like:
- Assign a value to a data element.
- Invoke another task, a handler, or a subprocess.
- Route a form to a queue.
- Invoke a web service. Web services are remote services that are available on the Internet. They are easily accessible from computer applications for conducting various high-level transactions.

**Note:** In the initial release, the system limits support for web services to non-HTTPS SOAP-based web services. Interaction Process Automation is designed to work well with web services that WCF creates.

An action can be part of a state, a task, another action, or can occur between work items. IPA Designer checks actions for validity and indicates when actions are in error. For example, you can’t add an “End Process” action anywhere but in a state, and you can’t call “End Process” inside a task.

IPA Designer provides a toolbox containing actions you can use in a process.

![Toolbox Image](image)

**Work Items**
You design and create work items in IPA Designer, and then display them to the user in Interaction Desktop or IPA Work Item Client. Work items gather input when a user starts a process.
Work items can include the following:

- A category.
- Description of the work item.
- A form that includes:
  - Input fields for the data to gather.
  - Buttons (for example, Approve and Deny) that become exit paths from the “Send Work Item to User” and “Send Work Item to Workgroup” actions.
  - Other controls bound to process variables with security restrictions that the user interface enforces.

When a user starts the corresponding process in Interaction Desktop or IPA Work Item Client, work items appear in the My Work Items tab. Work items appear as interactions in Interaction Desktop or IPA Work Item Client, similar to calls, emails, and other interaction types.

**Related Interactions**
A user can associate an interaction with a process in Interaction Desktop. Then, when viewing the process details later, the associated interactions appear.

**Licensing**
You assign and configure licenses for Interaction Process Automation in Interaction Administrator. A user can have only one of the following licenses:

- Direct Routed Work Items – Users with this license can receive work items routed directly to them.
- Group Routed Work Items – Users with this license can receive work items routed to them either directly or as a member of a workgroup (similar to an ACD queue).
- Process Monitor – Users with this license can view process statuses and details in the Process Monitor.
- Process Designer – Users with this license can receive work items or create and modify processes.

The licenses are cumulative. The Group Routed Work Items license includes the Direct Routed Work Items license. The Process Monitor license includes both of the Routed Work Items licenses. The Process Designer license includes all the other licenses.

**Security**
Interaction Process Automation uses these levels of security.

**Data Access Security**
Security at the data level allows an organization to control what data employees can see when processing sensitive customer information such as social security numbers, credit card information, and personal health information.

You can configure data access security by creating security specifications in Interaction Administrator and assigning them in IPA Designer to the applicable data elements. Security specifications are associated with a list of the people who have access to the related data element. Users not on the list are denied access.
Process Level Security
In addition to data security, Interaction Process Automation provides security at the process level. Only the users, workgroups, and roles with one of these access control categories assigned to them can access the corresponding features:

<table>
<thead>
<tr>
<th>Category</th>
<th>Users with this access category can:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Launch Process</td>
<td>Search for and start their own processes.</td>
</tr>
<tr>
<td>View Process</td>
<td>Search for and view any processes.</td>
</tr>
<tr>
<td>Manage Process</td>
<td>Search for, manage, cancel, and retry processes.</td>
</tr>
</tbody>
</table>

For more information about licensing, see the Interaction Administrator help in the PureConnect Documentation Library.

Variable Level Security
Logging of process variable values to reporting database tables is optional. This security feature works as follows:

- For new variables, the default option is not to log the values.
- For existing processes, the default option is to log the values to maintain consistency with the previous behavior.
- Trace statements that involve process variables no longer include the content of the variables.

The option to include a process variable value in the reporting database appears in IPA Designer when adding or editing a process-level variable. For more information, see the IPA Designer help in the PureConnect Documentation Library.

Persistence/Recovery
Interaction Process Automation was designed to recover any processes that are running when an outage occurs with the CIC server, network, or client application. When resources return to availability, Interaction Process Automation can restore the data and state information.

It is important that you don’t turn off your server intentionally without turning it off properly. However, unforeseen outages such as power failures can occur. The following scenarios describe how Interaction Process Automation recovers from an outage.

Switchover
In a switchover environment, one server runs in primary mode and the other runs in backup mode.

There are two types of switchover:

- An automated switchover occurs when there is a failure on the primary CIC server.
- A manual switchover occurs when the administrator purposely shuts down the primary CIC server to perform maintenance or install an update.

For general information about switchover, see the CIC Automated Switchover System Technical Reference in the PureConnect Documentation Library.

Manual Switchover
A CIC administrator can trigger a manual switchover using the Switchover Control Panel (for example, to allow for maintenance on a server or to install a CIC service update).
For information about using the Switchover Control Panel, see the CIC Automated Switchover System Technical Reference in the PureConnect Documentation Library.

Items that Require Special Handling
There are a few items and actions that create or use external resources and therefore require special handling when restored following an outage.

Routed Work Items
If the work item exists on the CIC server, then the Process Automation Server reconnects to the existing work item in the current state. If the work item doesn’t exist on the CIC server, the Process Automation Server creates the work item and uses the last saved attributes to determine the new state of the work item.

Work items that route directly to a user and are in the processing or held state restore to the same user in the held state. Work items that route to a workgroup and that are in the processing or held state restore to the workgroup in the held state.

Web Services and Run Handler Actions
Actions that run Web services and handlers can take the longest to run and are the most likely to be affected in the event of an outage. If either type of action is running when the server goes down, the system restores the action to the “restored in error” state since it is not possible to determine the extent to which the service or handler has run.

You can use IPA Monitor to retry/rerun these actions. For more information, see IPA Monitor on page 15.

CIC Client
If there is an outage with the Process Automation Server, work items that appear in Interaction Desktop or IPA Work Item Client remain open. However, users cannot commit work item data or change the state of a work item. The Process Automation Server reconnects to the existing work items when restarted.

If there is a switchover event, work items that appear in Interaction Desktop or IPA Work Item Client disappear and the connection to the failed server drops. Interaction Desktop or IPA Work Item Client reconnects to the new primary server when it is available and users can process the new work items. Work items started before the switchover event don’t reappear until after the failed primary server fully restarts as the backup server and the persistence data synchronizes.

IPA Monitor
If there is an outage with the Process Automation Server, IPA Monitor displays a message indicating that Process Automation Server is unavailable. The monitor reconnects and displays active processes again once the Process Automation Server restarts.

If there is a switchover event, processes that appear in the Process Monitor disappear and the connection to the failed server drops. The Process Monitor reconnected to the new primary server when it is available and new processes can start. However, processes started before the switchover event don’t reappear until the failed primary server fully restarts as the backup server and the persistence data synchronization occurs.


Other Server Parameters
In addition to the switchover-related server parameters documented in the previous section, the following optional server parameters are available. For more information about server parameters, see the Interaction Administrator Help.

PAS_blockLaunchDuringRestore
Boolean. If the value is “True,” “1,” or “Yes,” Process Automation Server blocks new user flow starts until it finishes restoring previously existing flows. This action prevents agents from starting extra flows instead of waiting for the restore.

PAS_DepthThreshold
Specify an integer for this parameter to indicate the number of spawned levels that a process can drill down to before Process Automation Server indicates an error for excessive recursion.

PAS_HandlerResponseTimeout
Note: Only processes migrated from Interaction Process Automation 3.0 use this parameter. Interaction Process Automation lets users configure timeout values for each action individually.
Use this parameter with the Run Handler action to specify how long Interaction Process Automation waits before displaying an error for the Run Handler action when the action doesn’t run successfully.

<table>
<thead>
<tr>
<th>Parameter Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>IPA waits N seconds before displaying an error.</td>
</tr>
<tr>
<td>(not set)</td>
<td>IPA defaults to a wait time of 30 seconds.</td>
</tr>
<tr>
<td>0</td>
<td>IPA does not display an error. The wait time is unlimited.</td>
</tr>
</tbody>
</table>

For more information about the Run Handler action, see the IPA Designer Help.

PAS Maximum Monitored Flows
Integer. Overrides the default maximum of 5,000 monitored flows in IPA Monitor. Create this parameter in Interaction Administrator's Server Parameters container. If you do not create this parameter and assign a value to it, IPA Monitor uses the default maximum of 5,000 monitored flows. The minimum value is 100.

PAS_LoadBalanceThreshold
This server parameter controls the load balancing of running process instances among off-servers. Set this parameter to the maximum number of process instances that must occur before load balancing occurs between off servers. The default is 5000. Do not set the value of this server parameter to less than 1000.

Event Log Messages
The following table describes various event messages that the Process Automation Server subsystem can record in the Windows Event Log on the Windows server.

<table>
<thead>
<tr>
<th>Event ID</th>
<th>Type</th>
<th>Message details</th>
</tr>
</thead>
</table>

Interaction Process Automation Technical Reference 16
### Error 41043
Process Automation Server cannot start because the database connection string for Workflow storage is missing.

### Informational 41044
Process Automation Server is attempting to use the default CIC database for Workflow storage. The preferred method is to provide a CIC Data Source named '%1' to direct the Workflow storage to the preferred database.

### Error 41045
Process Automation Server is attempting to open the storage database, but the connection has failed. For more information about the error, see the subsystem log.

### Error 41046
Process Automation Server is attempting to use the storage database, and executing a required stored procedure failed. It is likely that either the Process Automation Server tables and procedures don’t exist in that database, or that you didn’t set the permission to execute the procedures properly. For more information about the error, see the subsystem log.

---

### Adding a Certification Authority to Process Automation Server
If your organization plans to invoke processes that call secure web services using the HTTPS protocol, add the certificate from a certificate authority into the Certificate Authorities bundle file. The Certificate Authorities bundle file is on both the primary and backup servers that are running the Process Automation Server subsystem. The bundle file must contain a certificate from each secure web service used.

### Obtaining the Certificate
This document does not describe how to get a certification authority’s certificate. The administrator of the web service you use can provide its customers with a file that contains the certification authority certificate. If not, they can provide the URL for the certificate authority used to sign the web server’s certificate.

A certificate file typically has an extension of .cer or .pem.

### Procedure for Adding a Certificate
A CIC administrator must follow these steps once the certification authority certificate is available.

1. Use a text editor to open the IPA server certification authority file at this location: IC Installation\Certificates\ProcessAutomation\ca-bundle.crt.
2. In the open file, add an entry for the certification authority. This entry is typically the name of the certification authority.
3. Open the certification file in another text editor session and copy the text delimited by "---BEGIN CERTIFICATE-----" and "----END CERTIFICATE-----". Include the delimiters in the copied text.
4. Paste the copied content into the ca-bundle.crt file below the entry you created in Step 2.
5. Save the changes. The Process Automation Server can now invoke processes that contain web service actions that call that web server using the HTTPS protocol.

Troubleshooting
You can use server parameters to change the default memory thresholds for physical and virtual memory. While actively restoring processes, if the Process Automation Server reaches 90% of either configured thresholds, it stops restoring processes. The processes do not appear in Interaction Process Automation Monitor. An administrator can find warnings and errors in the log, but the warnings and errors aren't visible to users unless the users have access to the logs.

If the Process Automation Server stops restoring processes, wait until memory usage drops below the 90% threshold, and then restart the Process Automation Server. Process Automation Server attempts to restore processes again until it reaches the threshold.

For more information on the server parameters that allow you to configure memory thresholds, see Additional Server Parameters on page 16.
Appendix A: The Persistence File Conversion Tool (PFCT)

Note: Using the Persistence File Conversion Tool requires a certain amount of preparation, including the relevant tools and information. Read the appendix before you start using the tool.

This appendix describes how to convert persistence data for live, running process instances from Process Automation Server version 1 to Process Automation Server version 2. It explains the IPA Persistence File Conversion Tool (PFCT), and the manual steps required to ensure correct conversion of the persistence data.

As noted earlier in the IPA Technical Reference, Process Automation Server version 2 requires Microsoft SQL Server and does not work with Oracle databases. If your process automation uses an Oracle database, continue to use Process Automation Server version 1.

Prerequisites and Assumptions
This section lists the prerequisites and assumptions necessary before using the tool.

Stop Process Automation Server and Get Snapshot of Persistence Files
If the Process Automation Server version 1 or Process Automation Server version 2 services are running on the CIC server, the IC System Manager lists them with the following names:

- “Process Automation Server”
- “Process Automation Server v2.0”

If the Process Automation Server version 1 or Process Automation Server version 2 services are running, stop them on both the primary and backup servers.

Warning: Trying to convert persistence data while the Process Automation Server version 1 or Process Automation Server version 2 services are running could cause loss or corruption in process instances and the related data. The tool uses a snapshot of the persistence data. Stop Process Automation Server so that the snapshot does not change as the tool is running.

After stopping Process Automation Server, get a snapshot of the persistence data and protect it by renaming the existing persistence folder. The PAS_PersistencePath server parameter in Interaction Administrator sets the persistence folder so it could differ from the default folder shown here. Rename the folder from:

C:\I3\IC\Persistence\ProcessAutomationServer

to:

C:\I3\IC\Persistence\ProcessAutomationServer-Original

After you rename the folder, make the folder and its contents read-only. This action protects the original persistence files so that you can revert to Process Automation Server version 1 if necessary. However, Process Automation Server version 2 keeps its data in the database, so it does not use a persistence files folder.

Note: The number of persistence files is based on the number of running process instances and the complexities of the running processes. The folder could contain thousands of persistence files.

Verify You Have a Build That Supports the Tool
The Persistence File Conversion Tool (PFCT) consists of three files. Verify that your build of CIC includes these files:

These files were not available before CIC 2015 R3. Starting with CIC 2015 R3, the following program installs include these files:

- CIC server (C:\I3\IC\Server)
- IC Business Manager Apps
  C:\Program Files (x86)\Interactive Intelligence\BusinessManagerApps
- IC Server Manager Apps
  C:\Program Files (x86)\Interactive Intelligence\ServerManagerApps

If you do not have these files, then update to the latest 2015 R3 or later patch.

Ensure that the Process Definitions Migrated
The process definitions files are typically in this location on the server:
C:\I3\IC\Server\Flows\Workflows
Directory Services (DS) has entries that point to the files and mark the active process definitions (processes available to start). Use Interaction Migrator to migrate the process definitions and related DS entries. If the files and entries didn’t migrate, Process Automation Server cannot restore the process instances after conversion of the persistence files.

Have a Way to Batch-Import Microsoft SQL Server .SQL Files
The PFCT outputs a set of .SQL script files. You must have a SQL tool that imports the files into SQL Server. Microsoft SQL Server has this tool, as does the Microsoft SQL Server Management Studio:
sqlcmd.exe

Step 8 (a section later in this appendix) has a simple batch script that uses the “sqlcmd” tool to import the .SQL files.

Converting the Persistence Data
This section shows the steps to convert Process Automation Server version 1 persistence data into Process Automation Server version 2 persistence data.
If your CIC software is not on the C: drive, then adjust the paths as needed.

Step 1: Copy the PASv1 Persistence Folder
You previously made a snapshot of the existing Process Automation Server version 1 persistence data:
C:\I3\IC\Persistence\ProcessAutomationServer-Original
That folder stores and protects the persistence files. Make a working copy of the files and use the tool against the copy instead of the original files in the folder.
You can run the PFCT on the server (CIC server install) or on a separate machine (IC Business Manager Applications or IC Server Manager Applications installs). Run it on the same machine as the working files. If you copy the files to a machine other than the server, have the PFCT on that machine.
The PFCT creates verbose file names for output files to help with debugging. Therefore, use a short folder name for the files, such as:
C:\PASv1
If you made the original working files read-only, make the working copy of the folder writable.
**Step 2: Starting the Persistence File Conversion Tool**
There are two PFCT applications: console and GUI. They do the same thing. Use the GUI application unless you need the console program.

As you use the GUI tool, it shows equivalent command-line parameters for the console tool. To see all command-line parameters, use the Windows command prompt to type this command from the folder that has the console tool:

```cmd
```

These steps assume that you are using the GUI tool. To start the tool, run the following application from the folder that contains the tool:

```cmd
```

**Step 3: Setting the Source Folder**
The PFCT converts Process Automation Server version 2 persistence files from the source folder, and outputs SQL files in the Output Folder. Set the folder with the working copy of the Process Automation Server version 1 persistence files as the source folder:

```txt
C:\PASv1
```

**Step 4: Setting the Output Folder**
By default, the output folder is a subfolder underneath the source folder. The PFCT creates .SQL files in the output folder. Unless you have to change the output folder to a different physical disk because of disk space limitations, leave the default value.

```txt
C:\PASv1\PFCT
```

**Step 5: Setting the Output Folder Options**
The GUI tool includes the following options for specifying what to do about existing files in the output folder:
- Keep existing files in the output folder.
- Erase existing files in output folder.
- Create a timestamped subfolder in the output folder.

Genesys recommends that you choose the option for creating a timestamped subfolder unless there's a specific reason to choose one of the other options. These steps assume that you chose the third option.

**Step 6: Convert the Files**
The PFCT GUI has a Shell Command group box. It shows you the selected console command and options. It lets you copy the command to the Clipboard for later use. To run the conversion process directly from the GUI, click **Execute**. The **Execute** option in the GUI and the shell command do the same thing.

To cancel a conversion in progress, click **Stop** in the GUI or press **Escape** in the console program. It’s possible that the conversion won’t stop immediately. The PFCT detects the Cancel order, but waits for any running jobs to finish before it stops.

**Step 7: Review the Log**
The PFCT Execution Results section contains a log that it updates as conversions execute. The logs show conversion errors (if any) and statistical updates. The log shows conversion errors as the system detects them, but statistical updates occur only every few seconds. If processes or their relationships are complex, statistical updates are less frequent. More complex cases can take a few minutes.
After conversion is complete, look in the GUI’s Execution Results section or click **Open Log File** to review the end of the log. The last traces provide information about the files generated, any errors, and so forth. The log file created by the tool during the conversion is in the same folder as the output .SQL files.

**Warning**: If the log shows errors, it’s possible that the corresponding process instances aren’t in Process Automation Server version 2 when importing the generated SQL files. The PFCT created .SQL files in the output folder. If you used the suggested values, the output files are here:

C:\PASv1\PFCT\Conversion on YYYY-MM-DD HH-MM-SS

**Note**: If you chose the timestamped subfolder option, the folder name includes a date and time (GMT).

**Step 8: Import the SQL Files**

At this point, Microsoft SQL Server is running and you can batch-import an entire folder of .SQL files. This section describes one method, using the “sqlcmd” tool included in Microsoft SQL Server.

1. Create a batch file named import.bat, located in the same folder as the generated .SQL files.
2. Add the following line to the batch file, where you provide appropriate values for `{server}`, `{database}`, `{user}` and `{password}`:
   
   ```
   Note: Type this command on a single command line with no line breaks.
   
   for %%i IN (*.sql) Do sqlcmd -S {server} -d {database} -U {user} -P {password} -i "%%i" >> import.log
   ```
3. Run the batch file.
4. Check the import.log file to ensure that no errors occurred. The generated SQL files are now in the database.

**Step 10: Restart Other Services**

After changing the server parameter, restart all running instances of Session Manager and Interaction Processor. You can restart these services using IC System Manager. Wait until they are in the “Started” state before continuing.

**Step 11: Start Process Automation Server with the Storage ID**

In Process Automation Server version 2, a specific Process Automation Server version 2 server instance owns each process instance. They link to the server's storage ID. As a result, each Process Automation Server version 2 server instance also owns all the process instance database records associated with its storage ID.

The PFCT uses its own storage ID in SQL files that it creates. The tool always uses this storage ID, and only the PFCT uses it:

d094e0a7-85ac-4be9-b7b3-30933b6cf0f5

Since only the PFCT uses the PFCT storage ID, no server instance owns the converted records initially; their storage ID doesn't match that of any server instance.

To back out the records, isolating all the PFCT-generated records keeps them separate from existing records. You can use a database query to remove converted database records.

To migrate converted records into the ownership of a server instance, run the `flow_admin.exe` tool with no arguments. It lists the migrated process instances as associated with its own dummy server inside the tool. It asks whether you want to transfer...
the ownership of those instances to the ownership of a running Process Automation Server. If you click Yes, the tool contacts a running Process Automation Server instance and assigns it ownership.

Step 12: Verify Successful Conversion
After Process Automation Server version 2 starts, the process instances are available. The instances appear in Process Monitor, while work items appear in clients. You can view Process Details in Process Monitor and pick up work items. However, only converted processes appear. If you started process instances under Process Automation Server version 2 instead of converting them from PASv1, that persistence information is in the database but the instances don’t appear because they have a different storage ID.

Warning: If there is something wrong, do not continue. Once you merge the PFCT well-known storage ID with the normal storage ID for Process Automation Server running on the server, it’s difficult to back out the changes.

Step 13: Start Process Automation Server (The Normal Way)
Process Automation Server version 2 previously started from the command line with a special, well-known storage ID. That instance of Process Automation Server version 2 remains running.

Transfer the database from the PFCT’s storage ID to the one for Process Automation Server version 2 running on the server.

Start a normal instance of Process Automation Server version 2 by starting Process Automation Server v2.0 from IC System Manager.

Give the new instance of Process Automation Server version 2 time to start. After it shows as Started in IC System Manager, turn off the other instance of Process Automation Server version 2 that you used to test the converted process instances:

1. Locate the command-line window that is running that Process Automation Server version 2 instance.
2. Press Ctrl+C to stop that instance of Process Automation Server version 2 in a controlled manner.

Warning: Allow that instance of Process Automation Server version 2 to stop completely before closing the command window. If you close the window too early, it’s possible that the database records didn’t transfer properly to the other storage ID.

Note: There is also a “flow_admin” tool that you can use to move the database records between storage IDs. However, if two Process Automation Server version 2 instances are running, the records from the instance that you turned off transfer automatically to the remaining, running instance.

Step 14: Cleanup
Once all process instances migrate and you verified that you did not lose process instances or their data, delete the original persistence files, working persistence files, and generated SQL files.

Deleting the files provides better security because they contain plain-text batch instructions that can have passwords and other sensitive information. Leaving that information available is a security risk. However, if you encounter a conversion problem later, it helps to have the files. If you choose to keep the files instead of deleting them, consider encrypting them or using some other method to protect the information that they contain. The files are:

- C:\I3\IC\Persistence\ProcessAutomationServer-Original
- C:\PASv1
• C:\PASv1\PFCT\n• C:\PASv1\PFCT\Conversion on YYYY-MM-DD HH-MM-SS
## Change Log

<table>
<thead>
<tr>
<th>Date</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>November 17, 2011</td>
<td>Initial Release</td>
</tr>
<tr>
<td>March 8, 2012</td>
<td>• Updated for switchover enhancements.</td>
</tr>
<tr>
<td></td>
<td>• Added recovery procedure for situations where failed primary server data is not accessible to recover.</td>
</tr>
<tr>
<td></td>
<td>• Added manual switchover information.</td>
</tr>
<tr>
<td></td>
<td>• Added new server parameters.</td>
</tr>
<tr>
<td>August 9, 2012</td>
<td>• Added Troubleshooting section.</td>
</tr>
<tr>
<td></td>
<td>• Added descriptions of new server parameters.</td>
</tr>
<tr>
<td>September 11, 2012</td>
<td>• Added process-level security feature for PCI compliance.</td>
</tr>
<tr>
<td>September 27, 2012</td>
<td>• Added information about server parameters.</td>
</tr>
<tr>
<td>February 14, 2013</td>
<td>• Added persistence recovery information about test processes</td>
</tr>
<tr>
<td>April 24, 2013</td>
<td>• Added step to stop process automation server in section “What to Do When you Cannot Recover Data from the Failed Server.”</td>
</tr>
<tr>
<td></td>
<td>• Added note about enhanced security warning during server install.</td>
</tr>
<tr>
<td>August 16, 2013</td>
<td>• In the Persistence/Recovery section, added a note about using the replica copy of the persistence recovery files on the backup server in the event that the files on the primary server are corrupt or unreadable.</td>
</tr>
<tr>
<td>May 8, 2014</td>
<td>• Updated “Additional Server Parameters” to say that only migrated 3.0 prs use the PAS_HandlerResponseTimeout parameter. Rechecked all other content. Added coverage of how CIC handles queued IPA processes when there is a switchover (automatic or manual).</td>
</tr>
<tr>
<td>July 28, 2014</td>
<td>• Added several new server parameters.</td>
</tr>
<tr>
<td>September 1, 2014</td>
<td>• Updated documentation to reflect changes required in the transition from version 4.0 SU# to CIC 2015 R1, such as updates to product version numbers, system requirements, installation procedures, references to Product Information site URLs, and copyright and trademark information.</td>
</tr>
<tr>
<td>January 6, 2015</td>
<td>• Added information about Process Automation Server version 2 and new server parameters but holding for 2015 R3.</td>
</tr>
<tr>
<td>March 9, 2015</td>
<td>• Updated copyrights and made minor tweaks.</td>
</tr>
<tr>
<td>March 23, 2015</td>
<td>• Added Appendix A about the Persistence File Conversion Tool. Made other minor updates. Added a section about the IPA Web Client.</td>
</tr>
<tr>
<td>April 23, 2015</td>
<td>• Expanded sections about the Process Automation Server. Made other minor tweaks and updates.</td>
</tr>
<tr>
<td>September 9, 2015</td>
<td>• Updated documentation to reflect the removal of Interaction Client .NET Edition, and clarified that work items can be used with Interaction Desktop or IPA Work Item Client.</td>
</tr>
<tr>
<td>Date</td>
<td>Change</td>
</tr>
<tr>
<td>-----------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>October 15, 2015</td>
<td>• Added section about PASv2 off-server install.</td>
</tr>
<tr>
<td>August 24, 2016</td>
<td>• Added IPA Process Automation Server Version 2 section.</td>
</tr>
<tr>
<td></td>
<td>• Removed Rollback from Process Automation Server version 2 to PASv1 section.</td>
</tr>
<tr>
<td>August 15, 2017</td>
<td>• Rebranded to Genesys.</td>
</tr>
<tr>
<td></td>
<td>• Added detail about the PFCT and removed server parameter: PAS_usev2.</td>
</tr>
</tbody>
</table>